BEFORE
THE PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA

DOCKET NO. 2018-319-E

In the Matter of:	)	
	)	**DIRECT TESTIMONY OF**
	)	**STEVEN D. CAPPS**
Application of Duke Energy Carolinas, LLC for Adjustments in Electric Rate Schedules and Tariffs	)	**FOR DUKE ENERGY**
	)	**CAROLINAS, LLC**
	)	

I. INTRODUCTION AND OVERVIEW

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Steven D. Capps and my business address is 526 South Church Street, Charlotte, North Carolina.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am Senior Vice President of Nuclear Operations for Duke Energy Corporation ("Duke Energy"), with direct executive accountability for Duke Energy's South Carolina nuclear plants, including Duke Energy Carolinas, LLC's ("DE Carolinas" or the "Company") Catawba Nuclear Station ("Catawba") in York County, South Carolina, the Oconee Nuclear Station ("Oconee") in Oconee County, South Carolina, and Duke Energy Progress, LLC's ("DE Progress") Robinson Nuclear Plant ("Robinson"), located in Darlington County, South Carolina. I am responsible for providing oversight for the safe and reliable operation of these nuclear plants. I am also involved in the operations of Duke Energy's other nuclear stations, including DE Carolinas McGuire Nuclear Station ("McGuire") located in Mecklenburg County, North Carolina.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I hold a B.S. in Mechanical Engineering from Clemson University and over 31 years of experience in the nuclear field with increasing responsibilities. I joined Duke Energy in 1987 as a field engineer at Oconee. During my time at Oconee, I served in a variety of leadership positions at the station, including

Senior Reactor Operator, Shift Technical Advisor, and Mechanical and Civil Engineering Manager. In 2008, I transitioned to McGuire as the Engineering Manager. I later became plant manager and was named Vice President of McGuire in 2012. In December 2017, I was named Senior Vice President of Nuclear Corporate for Duke with direct executive accountability for Duke Energy's nuclear corporate functions, including nuclear corporate engineering, nuclear major projects, corporate governance and operation support and organizational effectiveness. I assumed my current role in October 2018.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A. Yes. I provided testimony in DE Carolinas' 2018 fuel and fuel-related cost recovery proceeding in Docket No. 2018-3-E.

Q. DOES YOUR TESTIMONY SUPPORT ALL GENERATION ASSETS INCLUDED IN THE COMPANY'S GENERATION PORTFOLIO?

A. No. My testimony focuses on the current operating nuclear assets.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to provide information in support of the Company's request for a base rate adjustment. To this end, I describe DE Carolinas' nuclear generation assets; update the Commission on capital additions since the prior rate case; provide a high-level view of capital additions planned for the upcoming years; explain key drivers impacting nuclear operations and maintenance ("O&M") costs; and provide operational

performance results for January 1, 2017 through December 31, 2017 (the "Test Period").

Q. WHAT ARE THE PRIMARY CAPITAL AND O&M DRIVERS WITHIN THE NUCLEAR FLEET DRIVING THIS REQUEST?

A. Capital investments have increased since the Company's last rate case. In particular, capital investments were made to comply with and address regulatory requirements, including the Nuclear Regulatory Commission ("NRC") 10 CFR Part 73, "Physical Protection of Plants and Materials" and National Fire Protection Association ("NFPA") 805, "Performance-Based Standard for Fire Protection." Further, DE Carolinas incurred costs to address end-of-life equipment and prudently manage aging systems via license extensions, efficiency, and reliability improvements. The Company has also incurred additional costs since the last rate case to meet requirements of the NRC near-term priorities stemming from Fukushima[1], including EA-12-049, "Order to Modify Licenses with regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" and EA-12-051, "Order Modifying Licenses with regard to Reliable Spent Fuel Pool Instrumentation."

Since the Company's last rate case, non-fuel O&M expense has declined slightly. DE Carolinas has managed O&M challenges driven primarily from inflationary pressure on labor and materials. The Company continues to make every effort to control costs and effectively maximize cost

[1] Industry reference to the March 2011 earthquake and tsunami in Japan, which resulted in damage to the Fukushima Daiichi Nuclear Power Station.

efficiency. For example, the Company undertook an effort to more effectively utilize contingent workers supporting refueling outages resulting in a decrease in outage costs; deployed a data analytics tool to improve monitoring and tracking of worker deployment, tenure and release; and streamlined the in-processing activities at the centralized King's Mountain facility, achieving a notable reduction in the time required to process incoming workers. The Company continues to identify efficiencies in organizational structure and innovation. However, despite these aggressive and significant efforts, DE Carolinas continues to face new costs and inflationary pressures.

Q. HOW IS THE REMAINDER OF YOUR TESTIMONY ORGANIZED?

A. The remainder of my testimony is organized as follows:

II. NUCLEAR FLEET: Generation Capacity and Asset Descriptions

III. CAPITAL ADDITIONS: In-Service For This Proceeding

IV. FORWARD VIEW OF CAPITAL ADDITIONS

V. O&M AND OTHER ADJUSTMENTS

VI. NUCLEAR OPERATIONAL PERFORMANCE: Metrics and Industry Benchmarking

VII. CONCLUSION

II. NUCLEAR FLEET

Q. PLEASE LIST DE CAROLINAS' NUCLEAR FLEET.

A. The Company's nuclear generation portfolio consists of 5,389 megawatts ("MWs") of power capacity made up as follows:

Oconee - 2,554 MWs

McGuire - 2,316 MWs

Catawba - 519 MWs [2]

Q. PLEASE GENERALLY DESCRIBE DE CAROLINAS' NUCLEAR GENERATION ASSETS.

A. The Company's nuclear fleet consists of three generating stations and a total of seven units. Oconee began commercial operation in 1973 and was the first nuclear station designed, built, and operated by DE Carolinas. It has the distinction of being the second nuclear station in the country to have its license, originally issued for 40 years, renewed for up to an additional 20 years by the NRC. The license renewal, which was obtained in 2000, extends operations to 2033, 2033 and 2034 for Oconee Units 1, 2 and 3, respectively. McGuire began commercial operation in 1981 and Catawba began commercial operation in 1985. In 2003, the NRC renewed the licenses for McGuire and Catawba for up to an additional 20 years each. This renewal extends operations until 2041 for McGuire Unit 1, and 2043 for McGuire Unit 2 and Catawba Units 1 and 2. The Company jointly owns Catawba with North Carolina Municipal Power Agency Number One, North Carolina Electric Membership Corporation and Piedmont Municipal Power Agency.

[2] Reflects DE Carolinas' 19.2 percent ownership of Catawba Nuclear Station.

Q. WERE THERE ANY POWER UPRATES COMPLETED WITHIN DE CAROLINAS' NUCLEAR PORTFOLIO SINCE THE LAST RATE CASE?

A. Yes. DE Carolinas' has completed Measurement Uncertainty Recapture ("MUR") power uprates on McGuire Unit 1 and Catawba Unit 1 since the Company's last rate case, Docket No. 2013-59-E (the "2013 Rate Case"). The MUR uprates were achieved by modifications to feedwater flow measurement instrumentation allowing more precise measurement of reactor power, resulting in higher thermal output.

III. CAPITAL ADDITIONS

Q. PLEASE PROVIDE ADDITIONAL DETAILS REGARDING MAJOR CAPITAL PROJECTS FOR NUCLEAR BEING INCLUDED IN THIS CASE.

A. Since the 2013 Rate Case, DE Carolinas has invested approximately $2.5 billion in capital projects. These capital improvements were required to enhance safety, address regulatory requirements, improve efficiency and output and preserve performance and reliability of the plants throughout their extended life operations. Catawba and McGuire have completed initiatives associated with main power open phase detection system upgrades to address an industry event that occurred at Exelon's Byron Generating Station and subsequent NRC bulletin 2012-01. The system will provide a fully redundant open phase protection system, thus improving safety margins related to offsite power. Also, Catawba and McGuire partnered on the design of multi-phase

projects to install emergency supplemental power source ("ESPS") diesel generators at both stations. The supplemental diesels provide increased safety margins and allow additional time and schedule flexibility in maintaining the station's emergency onsite power system, allowing emergency diesel generator ("EDG") maintenance to be performed with the units on-line versus during refueling outages. The supplemental diesels have been installed and tie-ins are complete on McGuire Unit 2. Catawba tie-ins are scheduled during the fall 2018 refueling outage. Projects supporting the transition to the risk-based NFPA 805 fire protection program have been completed at all 3 DE Carolinas stations, and license amendments are in place.

At Catawba, capital investments have been implemented to improve safety margins, comply with regulatory requirements, improve reliability and enhance efficiency and output. Since 2013, upgrades were completed to address aging and obsolete security monitoring equipment. Upgrades in both the Central and Secondary Alarm Stations were completed to ensure full compliance with the Nuclear Regulatory Commission's ("NRC") recent cyber security requirements and to address obsolete and aging components. Capital investments necessary for compliance with the NRC's near-term requirements related to Fukushima were also completed. Other reliability projects have addressed degraded performance of the service water systems. These multi-phase projects involved piping replacements, cleaning and coating of large portions of the systems and installing new chemical treatment capability. Significant phases of the service water projects have completed, but other

phases are scheduled to continue. Large motor replacements, including reactor coolant pump, condensate pump and residual heat removal pump motors have been completed addressing aging equipment issues and improving station reliability. In a multi-phase project addressing reliability and obsolescence, three of four diesel generator governors have been replaced; the forth scheduled to be replaced in late 2018 during the fall refueling outage. In May 2016, a MUR power uprate was implemented on Unit 1.

Projects at McGuire were initiated to enhance safety margins, comply with regulatory requirements, improve reliability, manage aging components and increase efficiency and output. Safety enhancing and regulatory compliance projects included the completion of the NRC's near-term post-Fukushima mods, and modifications in response to new cyber security requirements. Projects addressing reliability, obsolescence and aging components have been completed since the last rate case, or in the case of multi-phase projects, are nearing completion. Examples include reactor coolant pump motor refurbishments, main step-up transformer replacements, main steam isolation valve refurbishments and emergency diesel generator voltage regulator replacements. Significant main generator work was also completed, including stator and exciter replacements, and a MUR power uprate was completed on Unit 1.

Since the 2013 Rate Case, DE Carolinas has continued modernization projects at the Oconee station enhancing safety margins, regulatory margins,

and reliability. All near-term, post-Fukushima modification projects have been completed, and the Company has completed additional flood mitigation efforts associated with the Jocassee dam located approximately 12 miles upstream of the Oconee station. The Company also completed phases of a multi-phase project to enhance safety and regulatory compliance associated with mitigation efforts related to tornados and high energy line breaks ("HELB"). Key elements completed include the installation of a new Protected Service Water ("PSW") system and backup power sources to the standby shutdown facility. The PSW system provides an assured water supply to the steam generators for decay heat removal and power to a high-pressure injection pump to supply primary coolant inventory. Zinc injection systems have been installed and are operational on all three Oconee units. This system injects zinc into the reactor coolant system displacing nickel and cobalt, reducing both corrosion and radiation exposure to workers. With the installation at Oconee, all three DE Carolinas stations now have this technology deployed. Other modifications include projects such as step-up transformer replacements, reactor coolant pump and motor replacements, power circuit breakers and the installation of a new enhanced condenser tube cleaning system.

Q. ARE THE CAPITAL ADDITIONS AND ENHANCEMENTS YOU HAVE DESCRIBED IN YOUR TESTIMONY USED AND USEFUL IN PROVIDING ELECTRIC SERVICE TO DE CAROLINAS' ELECTRIC CUSTOMERS IN SOUTH CAROLINA?

A. Yes. These capital additions and enhancements are used and useful in safely and efficiently providing reliable electric service to DE Carolinas' customers. As a result of the Company's successful efforts to renew the licenses, refurbish obsolete equipment and systems and enhance safety margins in compliance with new NRC requirements, customers will continue to benefit from the power provided by this reliable, efficient, cost-effective and greenhouse gas emissions-free 24/7 power source of energy for many years to come. These investments have positioned the Company to maintain high levels of operational safety, efficiency and reliability that is reflected in the nuclear performance results I discuss later in my testimony.

Q. HAS DE CAROLINAS ATTEMPTED TO CONTROL COSTS FOR CAPITAL ADDITIONS AND O&M?

A. Yes. TheCompany controls costs for capital projects and O&M using a rigorous cost management program. For example, the Company routinely conducts executive oversight of project budget and activity reporting, with new projects requiring approval by progressively higher levels of management depending on total project cost. The Company also controls ongoing capital and O&M costs through strategic planning and procurement, efficient oversight of contractors by a trained and experienced workforce, rigorous

monitoring of work quality, thorough critiques to drive out process improvement and industry benchmarking to ensure best practices are being utilized. In December 2015, the U.S. nuclear industry launched a multi-year initiative entitled "Delivering the Nuclear Promise," to enable U.S. nuclear power plants to strengthen safety, increase efficiency, and reduce cost. As a result of this initiative, the Company has fully engaged with industry peers to identify and implement opportunities. However, despite these considerable efforts, DE Carolinas continues to face inflationary pressures as I have described.

IV. FORWARD VIEW OF CAPITAL ADDITIONS

Q. WHAT TYPES OF PROJECTS ARE IN THE CAPITAL BUDGET FOR NUCLEAR OPERATIONS FOR THE NEAR FUTURE?

A. In order to continue enhancing safety, equipment reliability, performance and to address aging equipment and regulatory requirements, DE Carolinas plans to invest approximately $594 million in its nuclear fleet during the period 2019-2021.

At Catawba, the multi-year emergency diesel generator ("EDG") reliability initiatives are scheduled to be complete with voltage regulator replacements concluding in 2020. The final phase of the ESPS project is currently scheduled for completion in 2019. To address stress corrosion cracking issues, low pressure turbine replacements have been scheduled, with Unit 1 slated for replacement in 2020 followed by Unit 2 in 2021.

At McGuire, main step-up transformer replacements will continue and are scheduled to be completed in 2019. The multi-phase ESPS diesel project is scheduled to complete in 2019 with the tie-in to Unit 1. Distributed control system upgrades, which will address obsolescence and reliability, are scheduled through 2020. Catawba and McGuire are jointly developing the upgrade design for both stations.

Oconee has regulatory and reliability projects scheduled out through 2021. For example, the replacement of feedwater heaters should be complete in 2020. This project replaces original equipment heaters containing carbon steel tubes that have been subject to failure, with new heaters containing upgraded stainless steel tubes. Remaining main power relay upgrades are also scheduled to complete by 2020. The new relays include protective functions that are not provided by the existing relaying equipment. Similar to the projects recently completed at Catawba and McGuire, Oconee is scheduled to complete the open phase detection system upgrades during 2019, enhancing the safety of offsite power. Low pressure turbines, diaphragms and associated components will be replaced to improve equipment reliability, eliminate stress corrosion cracking and recover lost efficiencies due to degradation. Open regulatory issues related to the Standby Shutdown Facility ("SSF") are expected to conclude by 2020. The open issue involves the SSF's thermal margin. The analysis is complete and a license amendment request was submitted to the NRC in October 2017. Receipt of license amendments is anticipated in spring 2020 along with completion of all associated

modifications. The final phases of the Keowee Hydroelectric Units ("KHUs") reliability upgrades are scheduled to complete by 2020 with stator replacements scheduled for KHU1 in 2019 followed by KHU2 in 2020. The completion of this multi-phase project will ensure that the Keowee Hydro units can continue to reliably supply emergency backup power to the Oconee station. Finally, Oconee will continue to upgrade its power circuit breakers in the Switchyard through 2020.

V. O&M AND OTHER ADJUSTMENTS

Q. PLEASE DESCRIBE SIGNIFICANT COST DRIVERS IMPACTING O&M EXPENSES FOR DE CAROLINAS' NUCLEAR FLEET.

A. During the Test Period, approximately 35 percent of the required O&M expenditures for DE Carolinas' nuclear fleet were fuel-related. A complete discussion of nuclear fuel costs can be found in Witness Church's testimony filed with this Commission on July 28, 2018 in the Company's annual fuel proceeding in Docket No. 2018-3-E. In his testimony, Witness Church noted that the Company anticipates costs of certain components of nuclear fuel to reflect modest decreases in future years. Nuclear fuel costs on a cents per kilowatt-hour ("kWh") basis will continue to be a fraction of the cents per kWh of fossil fuel. Therefore, customers will continue to benefit from the Company's diverse energy mix and the strong performance of its nuclear fleet through lower fuel costs.

Non-fuel items comprise the remainder of O&M expenditures for the nuclear fleet. Nuclear power plant operations are labor intensive and

therefore, a significant portion of O&M expenses are related to internal and contracted labor. The Company continues to face upward pressure on these ongoing labor costs and other challenges have occurred with rising costs for materials and supplies.

Q. WHAT EXAMPLES CAN YOU PROVIDE RELATED TO THE COMPANY'S EFFORTS TO CONTROL O&M COSTS AS NOTED ABOVE?

A. The Company has many efforts in place for controlling and/or saving costs. An area of focus in recent years has been outage optimization, focusing on duration, budget, dose and production. This approach applies strict controls to reduce outage durations, aligns typical maintenance work within duration templates, allocates costs based on duration templates, improves alignment of bulk work to minimize schedule impacts, and targets dose to the five-year ALARA[3] plan. Benefits of the outage optimization efforts have been demonstrated by record outage performance and durations at both McGuire and Oconee since 2015.

Further, the Company has been recognized by the Nuclear Energy Institute ("NEI") multiple times with Top Industry Practice ("TIP") awards. In 2015, the Company's Excellence in Cost Management program received an award for Vision, Leadership and Ingenuity. This program was developed and designed in response to the competitive economic pressures facing nuclear plants nationwide. The goal is to enhance sustainability in cost savings along

[3] Code of Federal Regulations (10 CFR 20.1003) acronym for "as low as (is) reasonably achievable."

with fleet performance. The recognition took note that Duke Energy saved more than $35 million in 2014 while still increasing worker safety, innovation and employee engagement. The program's objective will continue to drive sustainable results. Additionally, in 2017, the Company's nuclear procurement engineering organization won a TIP award when they developed the Procurement Engineering Prioritization, Reporting, and Obsolescence ("PE PRO") application. The organization also developed a Quality Receipt Inspector ("QRI") application. Both applications were implemented fleet-wide in March 2016, facilitating the prioritization and tracking of real-time priorities requiring support of the Fleet Procurement Engineering and Quality Receipt Inspector organizations. These applications increase nuclear safety by ensuring Procurement Engineering and Quality Receipt activities are correctly prioritized to support critical work activities and schedules.

Q. PLEASE DESCRIBE THE NRC REQUIREMENTS COMMUNICATED TO DATE WITH RESPECT TO FUKUSHIMA.

A. The NRC established regulatory requirements for the nation's operating reactors to address actions prioritized as "Tier One" by the NRC based upon its "Near-Term Task Force Review of Insights from the Fukushima Daiichi Accident." Specifically, on March 12, 2012, the NRC issued three reactor licensee orders[4] and a multifaceted letter request for information and actions

[4] See EA-12-049, "Order to Modify Licenses with regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events;" EA-12-050, "Order to Modify Licenses with regard to Reliable Hardened Containment Vents;" and EA-12-051, "Order Modifying Licenses with regard to Reliable Spent Fuel Pool Instrumentation."

under 10 CFR 50.54(f). The orders, effective immediately, require the Company to implement safety enhancements related to (1) mitigation strategies to respond to extreme natural events resulting in the loss of power at plants and (2) enhancing spent fuel pool instrumentation.

The 10 CFR 50.54(f) letter requires (i) a re-evaluation of seismic hazards and associated risks and description of any resulting mitigation actions, (ii) plant walk downs to assess seismic vulnerabilities, (iii) a flood hazard re-evaluation and description of any resulting mitigation actions, (iv) flood protection walk downs to assess flooding vulnerabilities, (v) an assessment of emergency communications equipment, and (vi) an assessment of the adequacy of plant staffing to address large scale natural events. DE Carolinas, along with the other nuclear power reactor licensees, was required to promptly begin implementation of the safety enhancements and complete implementation within two refueling outages or by December 31, 2016, whichever occurred first. Since the Company's last rate case, the NRC has initiated rulemaking proceedings related to enhanced requirements for coping with station blackout and integration of on-site emergency response capabilities. Additional NRC instructions/orders are expected to continue to be issued over the next three years in conjunction with these rulemaking proceedings.

Q. WHAT IS THE COMPANY'S CURRENT STATUS WITH RESPECT TO COMPLIANCE WITH THE NRC REQUIREMENTS RELATED TO FUKUSHIMA?

A. DE Carolinas promptly engaged in efforts to address the requirements with designing and implementing multiple diverse and flexible ("FLEX") coping strategies to address issues such as the loss of emergency power and temporary physical isolation of the site, which is a key focus of the near-term efforts. The Company also installed reliable instrumentation at each nuclear site to monitor spent fuel pool water levels and effectively prioritize any emergency activities that may be required. As of April 2016, all seven DE Carolina units have completed implementation of the FLEX and spent fuel pool level instrumentation orders. Also, the Company has made solid progress on completing the remaining Tier 1 work, which includes analyses to better understand how natural phenomena events such as earthquakes and flooding could impact our plants. Tier 1 efforts are currently expected to complete by December 2020.

Q. PLEASE DESCRIBE THE NRC REQUIREMENTS COMMUNICATED TO DATE WITH RESPECT TO CYBER SECURITY.

A. In 2009, the NRC published regulations[5] requiring licensees to protect digital assets associated with, and important to, safety, security and emergency preparedness functions. The NEI worked with the NRC and industry representatives (including Duke Energy) to develop NEI 08-09, "Cyber

[5] 10 CFR 73.54, "Protection of digital computer and communication systems and networks."

Security Plan for Nuclear Power Reactors," which was endorsed by the NRC in early 2010 as an acceptable means of meeting the requirements. NEI 08-09 utilizes cyber security controls from the National Institute of Standards and Technology standards,[6] which are heavily used throughout the U.S. government.

Q. WHAT IS THE STATUS OF THE COMPANY'S EFFORTS TO MEET THE NRC REQUIREMENTS COMMUNICATED TO DATE WITH RESPECT TO CYBER SECURITY?

A. DE Carolinas submitted its Cyber Security Plan and implementation schedule to the NRC and has received NRC approval. The activities outlined by the Company within its proposed Cyber Security Plan include examining current practices, developing cyber security program processes, reviewing critical digital assets, performing validation testing, and implementing new controls. The Company's necessary efforts to meet the NRC's cyber security requirements will increase its O&M expense long-term with efforts such as labor and maintenance. The Company has completed the necessary actions for implementation of the NRC requirements.

[6] SP 800-53, "Recommended Security Controls for Federal Information Systems," Revision 2 and SP 800-82, "Guide to Industrial Control Systems (ICS) Security," Final Public Draft, September 2008.

Q. ARE THERE CURRENT ISSUES IN THE NUCLEAR INDUSTRY THAT MAY FURTHER IMPACT COSTS FOR CAPITAL AND/OR O&M?

A. Yes. The Environmental Protection Agency has been developing new and/or stricter regulations regarding, among other things, water intake and cooling functions, which could result in significant impacts to the operational requirements of the Company's nuclear fleet. Although unlikely, there could be additional post-Fukushima, seismic related modification requirements at Oconee. Finally, security and cyber defense requirements could evolve if new threats are identified. These key areas of focus could result in added and perhaps significant capital and/or O&M costs.

VI. NUCLEAR OPERATIONAL PERFORMANCE

Q. WHAT ARE DE CAROLINAS' OBJECTIVES IN THE OPERATION OF ITS NUCLEAR GENERATION ASSETS?

A. The primary objective of DE Carolinas' nuclear generation department is to safely provide reliable and cost-effective energy to DE Carolinas' customers. The Company achieves this objective by focusing on a number of key areas. Operations personnel and other station employees are well trained and execute their responsibilities to the highest standards in accordance with detailed procedures. The Company maintains station equipment and systems reliably, and ensures timely implementation of work plans and projects that enhance the performance of systems, equipment, and personnel. Station refueling and maintenance outages are conducted through the execution of well-planned,

well-executed and high quality work activities, which effectively ready the plant for operation until the next planned outage.

Q. PLEASE DISCUSS THE PERFORMANCE OF THE COMPANY'S NUCLEAR FLEET DURING THE TEST PERIOD.

A. As in years past, DE Carolinas' nuclear fleet continued to perform well. During the Test Period, the Company achieved a combined capacity factor of 95.87%. Each of the 3 plants exceeded a 92.5% capacity factor, and the Company recorded the 2nd highest net annual output, falling just short of the generation record established in 2016. Sixty-two percent of the Company's total power generated during 2017 was from the nuclear fleet, and 2017 represented the 18th consecutive year of DE Carolinas' nuclear plants exceeding a 90 percent annual capacity factor. This output above 90 percent has resulted in approximately 36 million MWs of additional generation, or 7.5 months of output, over the 18-year period. These performance results demonstrate DE Carolinas' continued commitment to achieving high performance and reliability without compromising safety.

Q. WHAT INITIATIVES HAS THE COMPANY TAKEN TO INCREASE EFFICIENCIES IN NUCLEAR OPERATIONS?

A. The Company uses benchmarking, long-range planning, work prioritization tools and other processes to continuously improve operational and cost performance. Over the years, the Company has gained efficiencies from the implementation of common policies, practices, and procedures across the Duke Energy nuclear fleet. In addition, efficiencies are sought by

incorporating industry best practices. Since the merger, the Company continues to remain focused on improving fleet performance in various areas, and a focus on organizational effectiveness allows the Company to continue to identify and address work improvements. The goals are to align operations at a fleet level and take advantage of shared experiences and process improvement opportunities. Results of the Company's efforts have been demonstrated by successive output records and unit outage performance. Overall, improvement efforts result in enhanced fleet reliability and efficiency on a cost per kWh basis.

Q. WHAT CHALLENGES DOES DE CAROLINAS FACE REGARDING ITS NUCLEAR OPERATIONS?

A. Despite the success of the Company's efficiency initiatives to mitigate cost increases, DE Carolinas continues to face upward pressure on O&M costs. A significant challenge facing the nuclear industry is the cost and technological requirements to maintain the existing U.S. nuclear fleet at the highest levels of safety and reliability, while also maintaining economic viability and ensuring these plants continue to provide emission-free energy in the future. Therefore, maintaining the Company's nuclear assets is critical to achieving significant reductions to current and future levels of greenhouse gas emissions, and ensuring the diversity of energy supply for our customers.

Q. HOW DOES THE COMPANY'S NUCLEAR FLEET COMPARE TO OTHERS IN THE INDUSTRY?

A. The Company's nuclear fleet has a history of top quartile performance. Industry data for 2017 ranked Duke Energy's nuclear fleet favorably when compared to the seven other large domestic nuclear fleets using Key Performance Indicators ("KPIs") in the areas of personal safety, radiological dose, manual and automatic shutdowns, capacity factor, forced loss rate, industry performance index, and total operating cost. The Duke fleet ranked first in the overall composite ranking of the 7 industry key performance metrics, and placed in first position in total operating cost and second place in annual capacity factor. On a larger industry basis using data for 2017 from the Electric Utility Cost Group, DE Carolinas' plants (Catawba, McGuire, and Oconee) all ranked in the top quartile in total operating cost among the 60 U.S. nuclear plants reporting. Industry benchmarking efforts are a principal technique used by the Company to ensure best practices are implemented and results are sustained. These efforts further ensure overall safety, efficiency, and reliability of DE Carolinas' nuclear units.

Q. ARE THERE CURRENT ISSUES IN THE NUCLEAR INDUSTRY THAT MAY FURTHER IMPACT COSTS FOR CAPITAL AND/OR O&M?

A. Yes. Additional requirements related to Fukushima are possible as the NRC's review efforts are on-going. Additionally, the Environmental Protection Agency (the "EPA") has been developing new and/or stricter regulations

regarding, among other things, water intake and cooling functions, which could result in significant impacts on the operational requirements of the Company's nuclear fleet. These key areas of focus could result in added and perhaps significant capital and/or O&M costs.

II. CONCLUSION

Q. IS THERE ANYTHING YOU WOULD LIKE TO SAY IN CLOSING?

A. Yes. The Company has a proven history of cost competitive operation of its nuclear assets concurrent with maintaining safety, quality, and reliability. DE Carolinas is positioned to continue as a leader in the industry with a solid base of knowledge and experience, and with a nuclear fleet that is highly efficient and reliable. This base rate increase will allow the Company to continue the tradition of operational excellence and focus on safe operations, reliable generation, and strong performance that ultimately benefits our customers.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.